

REMARKS

Claims 10, 14, 18 and 22-24 are pending in the Application. Claims 11-13, 15-17 and 19-21 have been canceled from the application without prejudice. New claims 22-24 have been added to the application. Figure 1 has been amended, as required by the Examiner, to include numeric designations for certain features disclosed in the specification but not identified in Figure 1. No new matter has been added to the drawings, the specification or claims by way of these amendments.

The Examiner's grounds for objecting to and/or rejecting the application and claims are traversed or they are overcome as set forth below.

I. THE PRESENTLY CLAIMED INVENTION

The amendments made to independent claims 10, 14 and 18 above emphasize that one purpose of the micro engine of the present invention is to produce thrust. A related feature of the invention was emphasized by adding to each independent claim "a duct surrounding the exit from the nozzle through which air is drawn in consequence of the flow" of decomposition and combustion products through the nozzle. New dependent claims 22-24 relate to the illustrated embodiment where the air is drawn through the duct (9 in the drawing) by a fan (8) driven by a turbine (7).

II. THE DRAWING OBJECTION

The Examiner objected to the drawings under 37 CFR 1.83(a). The Examiner explained that the drawings must show the decomposition region and the combustion region as described in the specification and claims.

The Examiner's objection has been overcome by amending Figure 1 to include numeric designations for the decomposition region with catalyst (5a), combustion region (5b), and nozzle (5c). The specification has been amended accordingly to include the same numeric designations – 5a, 5b, and 5c in the description of the Figure 1 features. These features find support in the specification at, for example, page 1, lines 15-20 and page 2, lines 15-22.

II. TRAVERSE OF THE ANTICIPATION REJECTION

The Examiner rejected claims 10, 14 and 18 under 35 USC Section 102(e) as being anticipated by the Schneider U.S. Patent No. 6,272,846. It is the Examiner's position that Schneider teaches a micro engine that includes all of the features of the rejected claims.

Claims 10, 14 and 18 have been amended as discussed above to include features not disclosed or suggested in Schneider. In particular, claims 10, 14 and 18 have been amended to include a duct surrounding the exit from the nozzle through which air is drawn as a consequence of the flow of combustion products through the nozzle.

In contrast, the Schneider thrusters are designed to direct exhaust straight out of the nozzle from the combustion chamber. There is no surrounding duct through which air is drawn in Schneider. Indeed the provision of such a duct would be useless in the satellite thrusters of Schneider since satellites operate in space - where there is no air.

Moreover, despite the Examiner's allegation that Schneider teaches a micro engine, there is nothing in the reference which teaches a micro-scale device. Schneider is concerned with thrusters for satellite propulsion, some of which are stated to be "in a smaller thrust class" (e.g. at column 5, lines 5-9) but this Schneider excerpt does not imply or even require the micro class of machinery with which the present invention is concerned. Schneider is silent as to any quantitative measure of the "smaller thrust class" to which he refers. Certainly there is no disclosure of dimensions, weights and thrusts comparable with those quantified in the present application.

For at least these reasons, Schneider does not disclose every feature of presently pending claims 10, 14, and 18 and the Examiner's anticipation rejection should be withdrawn.

VI. TRAVERSE OF THE OBVIOUSNESS REJECTIONS

A. Traverse Of The Hefferman Obviousness Rejection

The Examiner rejected claims 11-13, 15-17 and 19-21 as being unpatentable for obviousness over Hefferman U.S. Patent No. 4,047,380. This rejection is now moot in view of the cancellation of the rejected claims from the application without prejudice. Furthermore, presently pending claims 10, 14, 18 and 22-24 are not obvious because at least the following features of the claimed invention are not disclosed or suggested by Hefferman: (i) a micro engine having a duct

surrounding the exit from a nozzle through which, in use, air is drawn in consequence of the flow of decomposition and combustion products through the nozzle; (ii) a micro-engine in general; and (iii) a thrust-producing engine.

(i) There is no hint or suggestion in Hefferman of a device that decomposes and combusts hydrogen peroxide to produce thrust. Instead, in Hefferman, the “output of combustion chamber 20 is a mixture of hot gasses under high pressure which is used to drive a primary motor such as a turbine engine.” (Col. 3, lines 44-46). Furthermore, on exit from the combustion system - seen in Figure 3 of the reference - the hot pressurized gases pass through a 90° elbow following restrictor 66, which would certainly not be conducive to maximising thrust. Similarly there is no disclosure or suggestion in Hefferman that the associated turbine engine has a duct surrounding the exit from a nozzle for drawing in air. Similarly, with respect to claim 22 there is no hint or suggestion in Hefferman that the associated turbine engine drives a fan for drawing in air. Clearly, the Hefferman combustion system is used in underwater applications such as submarines to drive turbines to produce electricity and/or to produce mechanical motion to propel a submarine through water.

(ii) The Examiner acknowledges that Hefferman does not disclose a micro engine but alleges that it would be obvious to use the teachings of Hefferman for this purpose because it is mainly a question of engine size design choice. However, the design, operation and manufacture of micro-machinery involve challenges and goals which are quite different to those at macro scale due to the inherent changes in effect of physical and thermodynamic processes at micro scale. Therefore the Examiner’s position that teachings related to macro scale objects can obviously be applied to micro scale objects is wrong.

(iii) The Examiner’s claim rejections over Hefferman are premised upon admission after admission that Hefferman does not show various features of the claimed invention coupled with allegations that those features are inherent since the Hefferman invention “is to be used with a turbine engine (i.e. gas turbine ducted fan engine)”. The implication is that the unillustrated and undescribed turbine engine to which the gases from the Hefferman combustion engine are directed is necessarily a ducted fan type engine. There is, however, no inference that can be drawn from Hefferman to support such a contention. Turbine engines come in numerous forms for numerous purposes. The only purpose for the turbine suggested by Hefferman is for

underwater applications (column 1, lines 16-18). Therefore, the proper inference to derive from this teaching is that the associated turbine is used to drive a submarine propeller. It is improper, therefore, for the Examiner to attribute particular features to the turbine engine mentioned by Hefferman that are contrary to the teaching of the reference to reject claims which include features as to which the reference is silent.

Each of the grounds for overcoming the obviousness rejection over Hefferman set forth above provide an independent ground for the patentability of claims 10, 14, 18 and 22-24.

B. Traverse Of The Ariga Obviousness Rejection

The Examiner rejected claims 11, 15 and 19 as being unpatentable for obviousness over Ariga U.S. Patent No. 3,898,794. This rejection is also rendered moot in view of the cancellation of claims 11, 15 and 19 from the application. Furthermore, presently pending claims 10, 14, 18 and 22-24 are not obvious because the following features of the claimed invention are not disclosed or suggested by Ariga: (i) a micro engine having a duct surrounding the exit from a nozzle through which, in use, air is drawn in consequence of the flow of decomposition and combustion products through the nozzle; (ii) a thrust producing engine; and (iii) a micro-engine in general.

(i) & (ii) As with Hefferman, the Examiner's claim rejections over Ariga are replete with admissions that the reference does not show various features coupled with allegations that those features are inherent since Ariga's invention "is to be used with aircraft engines, i.e. gas turbine ducted fan engine". Once again there is no basis for the implication that Ariga's engine is of a ducted fan type. In fact inherency should not even have been alleged since Ariga discloses a complete powerplant **including** a turbine wheel 52. The Ariga powerplant is, however, not a thrust-producing powerplant. Instead the power output is purely mechanical, via a gear train to the shaft 64 shown in Figure 1 and through a flywheel 72 to a vehicle axle 94 in Figure 2 and an electrical generator 98 in Figure 3 of Ariga. After passing the turbine wheel 52 the combustion gases are exhausted, not through a nozzle as claimed, but through a radially-directed exhaust 54 which is clearly neither intended nor orientated to provide thrust. The venturi portion 48 of the casing upstream of the turbine 52 – which could be regarded as a nozzle - is not surrounded by a duct for drawing in air as is presently required by every pending claim. Ariga does disclose an air nozzle 56 inside venturi portion 48 for drawing in air to increase the mass flow to the turbine. However, Ariga does not disclose or suggest an apparatus including "a duct **surrounding the exit**

from [the] nozzle" as is the case with all of the currently pending application claims. Moreover, with respect to claim 22 there is no fan driven by Ariga's turbine 52 for drawing in air.

(iii) With respect to the Examiner's allegation that it would be obvious to use the teachings of Ariga for a micro engine the same remarks apply as made above in relation to Hefferman.

Each of the grounds for overcoming the obviousness rejection over Ariga set forth above provide an independent ground for the patentability of claims 10, 14, 18 and 22-24.

CONCLUSION

In view of the foregoing remarks, it is respectfully submitted that presently pending claims 10, 14, 18 and 22-24 are patentable over the art of record in this case. An early notice thereof is, therefore, earnestly solicited.

Respectfully submitted,

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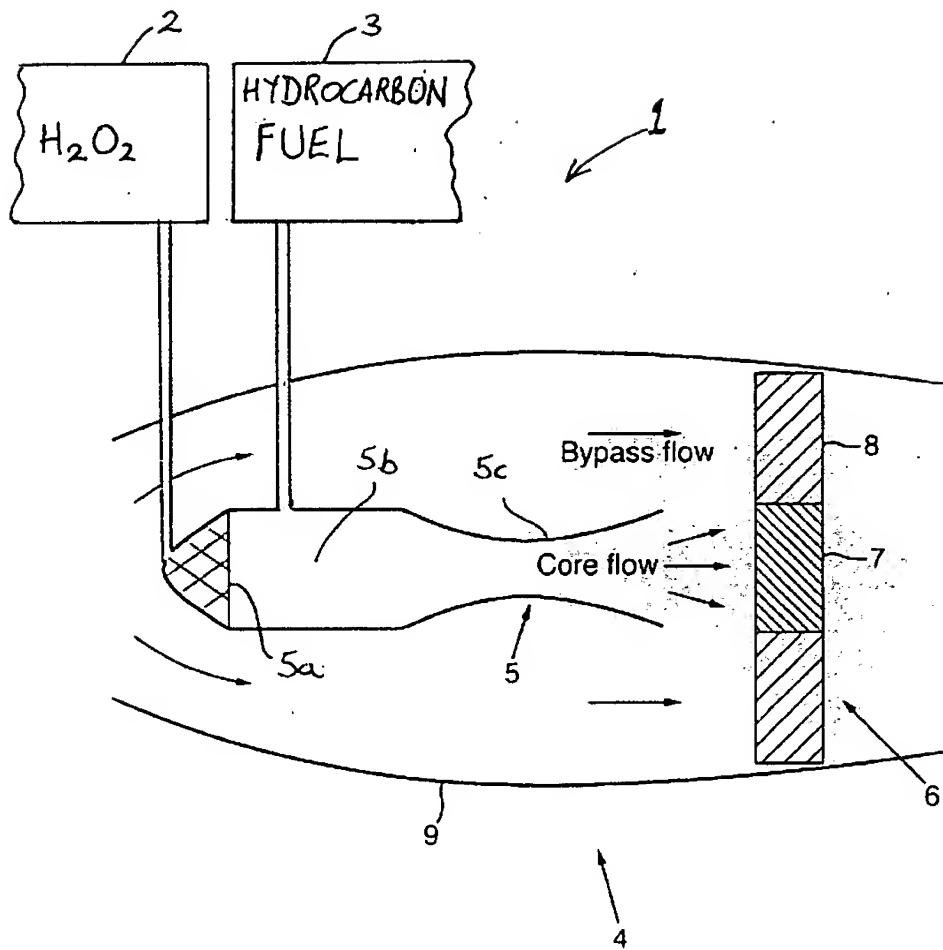


Figure 1

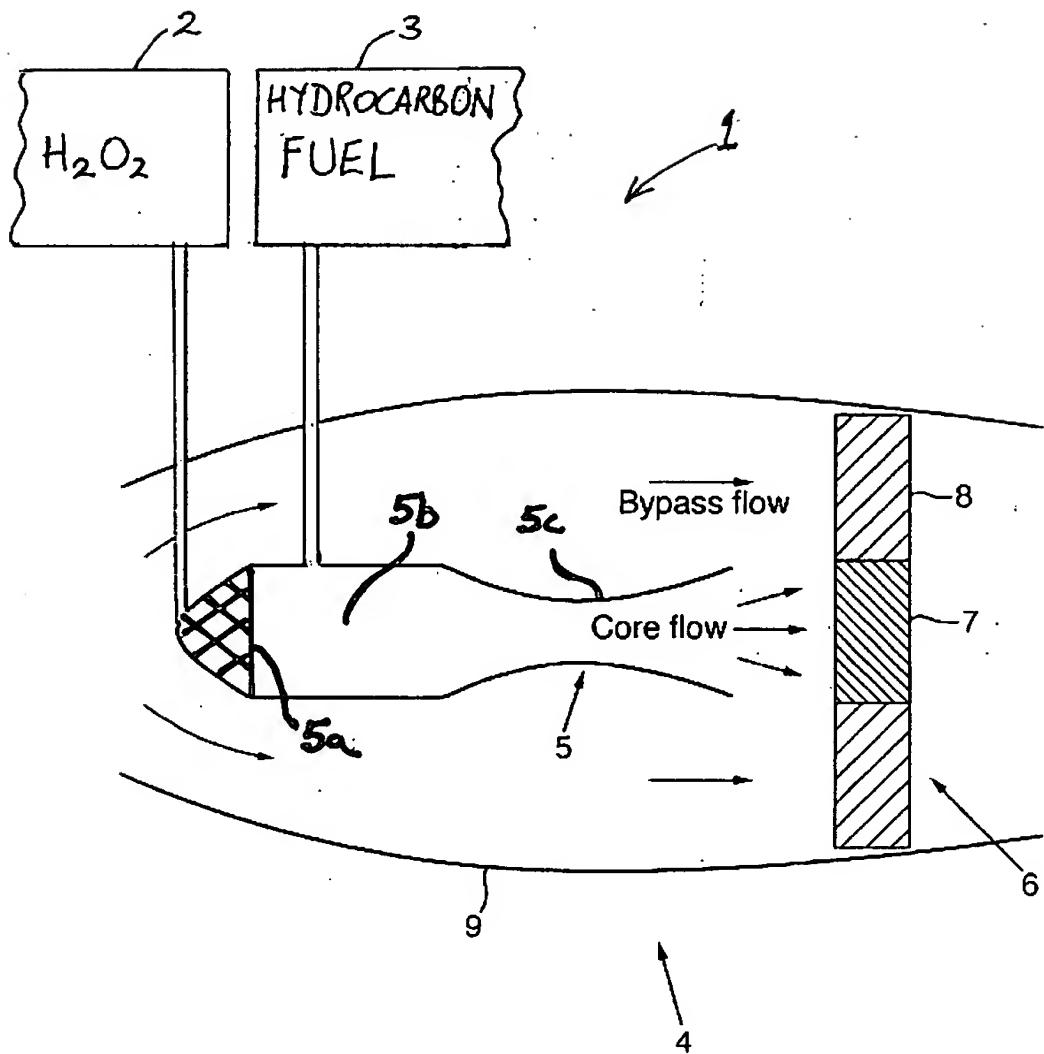


Fig. 1